

Public Water Supply
Source Water Assessment
For
Blades Water

PWS ID: DE0000865

Sussex County, Delaware



November 16, 2018
Revised From January 29, 2002

State of Delaware
Department of Natural Resources and Environmental Control
Division of Water Resources
Source Water Assessment and Protection Program
89 Kings Highway
Dover, Delaware 19901

Phone: (302) 739-9945

Fax: (302) 739-2296

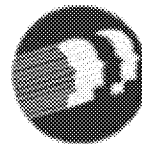


Table of Contents

Table of Contents	i
List of Figures	ii
List of Tables	ii
Introduction	3
Location and Population Served	4
Geology and Hydrogeology	4
Public Water Supply Well Information	6
Wellhead Protection Area Delineation	6
Vulnerability Determination	9
Existing and Potential Sources of Contamination	9
Discrete Sources	10
Non-Point Source Contamination	11
Roads and Railroads	13
Water Quality	14
Naturally Occurring Contaminants	15
Analytical Data	15
Water Treatment Methods	16
Susceptibility Determination	16
Contaminant Inventory	17
Water Quality and Susceptibility	18
Individual Susceptibility	18
System Susceptibility	19
Summary	21
References	23
Appendix A. Maps	25
Appendix B. Tables	35
Appendix D. Data Sources	56
Appendix E. Historical Wells	57

List of Figures

Figure 1. Wellhead Protection Areas	5
Figure 2. Vulnerability Determination	10
Figure 3. Land Use in Wellhead Protection Area	13
Map 1. Base Map for Wellhead Areas	27
Map 2. Delineation Map for Wellhead Areas.....	29
Map 3. Discrete Sources within Wellhead Areas	31
Map 4. Land Use within Wellhead Areas.....	33

List of Tables

Table 1. Well Construction Data	6
Table 2a. Aquifer Type and Delineation Method.....	7
Table 2b. Delineated Source Water Areas.....	7
Table 2c. Model Parameters	8
Table 2d. Model Settings	9
Table 3. Types of Discrete Sources of Contamination	10
Table 4. Roads and Railways found within the Wellhead Protection Area	14
Table 5. Contaminant Classes	17
Table 6. System Susceptibility Rating.....	20
Table 7. Contaminant Potential from Individual Types of Discrete Sources by WHPA.	37
Table 8. Contaminant Potential from Total Discrete Sources by System	37
Table 9. Contaminant Potential from Each Land Use within WHPA.....	38
Table 10. Contaminant Potential from Total Land Use within WHPA	39
Table 11. Contaminant Potential from Total Land Use within the System	40
Table 12. Individual Wellhead Protection Area Susceptibility.....	41
Table 13. Available Analytical Data	43
Table 14. Data Sources Used in Source Water Assessments.....	56
Table 15. Historical Record of All Wells Associated with Facility.	57

Introduction

In 1974, the United States Congress passed the Safe Drinking Water Act (SDWA). This Act is to protect public health by regulating the nation's public drinking water supply (EPA, 1974). Amendments to the SDWA passed in 1996 required each State to complete a Source Water Assessment for each public drinking water system (EPA, 1997). The United States Environmental Protection Agency (EPA) approved Delaware's Source Water Assessment Plan in October 1999.

The Delaware's Citizens Technical Advisory Committee (CTAC) developed the Delaware's Source Water Assessment Plan (SWAP). The committee is composed of scientists, water industry professionals, conservation groups, government agencies, and interested citizens.

The EPA mandates that an Assessment be available to the public. The purpose of this document is to provide information to help drinking-water system operators identify the potential threats to their drinking water supply and work to protect these drinking water sources.

The Assessment includes four maps:

1. The Base Map shows the location of the system and each well.
2. The Delineation Map shows the boundaries of the wellhead protection area(s).
3. The Discrete Source Map identifies the location of known contaminants within the wellhead protection area.
4. The Land Use Map shows land use or land cover within the wellhead protection area(s).

Using these maps and the supporting tables, DNREC identifies the potential sources of contamination and assesses the susceptibility of public-water sources to these contaminants.

The Department of Health and Social Services, Division of Public Health, Office of Drinking Water (DPH-ODW) samples all public wells and performs the analysis in their Certified Drinking Water Laboratory. They provide the chemical and biological analysis information for the Assessments. They also provide the daily population of persons served by the system.

Location and Population Served

Blades Water is located in the Town of Blades on the southwest corner of West 4th Street and Market Street. (Appendix A, Map 1). This public water supply system provides water to an average daily population of 1,200 residential consumers from January 1 to December 31 through 468 residential service connections.

Geology and Hydrogeology

Hydrogeology is the study of the interrelationships of geologic processes and materials with groundwater. These materials are deposited over geologic time with changes in the earth's environment. These deposits become layers. Some materials can easily transmit water while others slow its movement. Materials that transmit water are aquifers; those that stop its movement are confining layers. The Source Water Assessment Protection Program (SWAPP) identifies three types of aquifers; unconfined, confined, and semiconfined.

The water table aquifer is an unconfined aquifer because there are no confining beds between the saturated materials and the ground surface. A confining bed overlies a confined aquifer (Figure 1). These confining layers are generally composed of silts or clays. A leaky confining layer usually overlies semiconfined aquifers. An aquifer may be semiconfined aquifer because the overlying confining layer does not extend far enough laterally to inhibit vertical movement of water.

The Town of Blades withdraws water from three wells in the unconfined Columbia Group aquifer. The surficial unit of the unconfined aquifer is the Beaverdam Formation (Ramsey and Tomlinson, 2014). Within the models domain, the Beaverdam Formation is underlain by the confined Manokin aquifer in the northern portion and the sub cropping Pocomoke aquifer in the south (McLaughlin et al., 2015).

Within the study area, the Manokin aquifer dips to the southeast from depths of approximately -50 to -75 feet msl (McLaughlin et al., 2015). It is confined in most of the area. However there are areas where the confining unit between the unconfined aquifer has eroded and the sands of the unconfined aquifer are in direct contact with those of the Manokin (McLaughlin et al., 2015).

The sub cropping Pocomoke aquifer overlies the confined Manokin aquifer. In some areas the Manokin aquifer may be overlain by a few feet to tens of feet of Pocomoke sand with no confining unit (McLaughlin et al., 2015). In the subcrop area the sands of the unconfined aquifer are hydrologically connected to the Pocomoke aquifer.

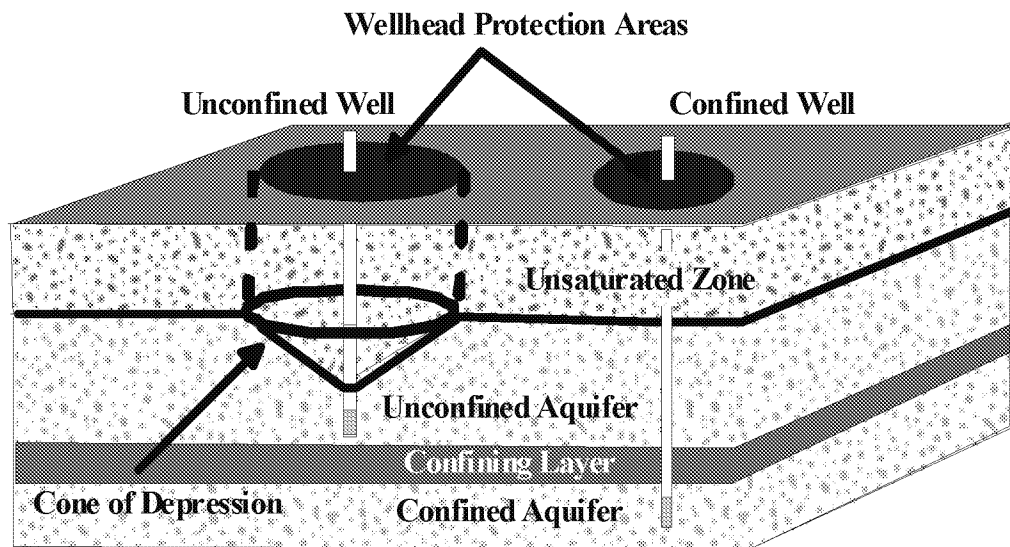


Figure 1. Wellhead Protection Areas

The source of most drinking water in Delaware is from aquifers. The water table aquifer is unconfined because there are no confining beds between the saturated materials and the ground surface. A confining bed overlies a confined aquifer. Unconfined aquifers draw down the water table creating a cone of depression.

Within the subcrop area for the Pocomoke aquifer, the confining units that separate the overlying Beaverdam Formation is eroded. In places, the sands of the Pocomoke aquifer are in direct contact with the Beaverdam Formation and acts as part of the unconfined aquifer (McLaughlin et al., 2015).

In the modeled area, the Beaverdam Formation consists of two stratigraphic units. The upper unit ranges in color from yellow-orange, light brown and light gray. It is composed of silty, fine to medium quartzose to moderately feldspathic sand, sandy silt, clayey sandy silt and clayey silt beds that are up to 35 feet thick. The lower beds are commonly gravelly and are up to 70 feet thick (Andres and Ramsey, 1995).

The Beaverdam Formation is of Pliocene age. The Pliocene Epoch began approximately 5.3 million years ago and ended approximately 2.6 million years ago (Walker et al., 2012). The Beaverdam Formation is interpreted as fluvial to estuarine deposits of late Pliocene age (Groot and Jordan, 1999; Groot et al., 1990; McLaughlin et al., 2015; Ramsey, 2010).

Public Water Supply Well Information

When a public well is drilled, the driller files a Completion Report. The Completion Report contains the construction details and a Formation Log. The construction details include the diameter of the well, the depth of the well, and the length of the screen. The length of the screen and its depth determines the screen interval.

How much water the well can pump is limited to the capacity of the pump and how much water the aquifer can produce. This is called the well capacity. It is reported in gallons per minute (gpm). Hydrologists determine the aquifer the well pumps water from by the depth of the screen interval. They use geologic information from the Delaware Geological Survey (DGS) and historical well permitting records to construct a geologic profile to identify the aquifer. The information about the construction, operation, and aquifer assignment of the wells serving Blades Water are in Table 1.

This assessment identified additional wells associated with this public water system (Appendix E., Table 15).

Table 1. Well Construction Data

Completion Reports filed by the well driller includes information about the construction and operation of each well.

DNREC ID	Local ID	Allocation No.	Year Constructed	Well Capacity (gpm)	Diameter (inches)	Screen Interval (fbgs)	Aquifer
40024	1	89-0001	1978	150	8	66 - 96	Columbia Group
40025	2	89-0001	1978	150	8	66 - 96	Columbia Group
248353	3	-	2014	150	8	65 - 90	Columbia Group

* fbgs = feet below ground surface

Wellhead Protection Area Delineation

The mapping of the wellhead protection area is called delineation. Wellhead protection areas are surface and subsurface areas surrounding public water supply wells that contribute water to the well. The delineation identifies land use and land use activities within the wellhead protection area that may adversely affect the quantity or quality of ground water pumped by the well.

The wellhead protection area for Blades Water contains three wells (Appendix A, Map 2). These wells withdraw water from the unconfined Columbia Group aquifer. The individual wellhead protection areas for each well were delineated using a computer model (Table 2a). The Source Water Assessment and Protection Program uses the term well field to refer to the area where multiple wells belonging to the same system are located. The delineated area of the well field at Blades Water is approximately 35.5 acres (Table 2b).

Table 2a. Aquifer Type and Delineation Method

Wellhead protection areas are delineated based on the well type of aquifer and the pumping capacity of the well (DNREC, 1999)

DNREC ID	Local ID	Aquifer	Aquifer Type	Delineation Method
40024	1	Columbia Group	Unconfined	WhAEM Model
40025	2	Columbia Group	Unconfined	WhAEM Model
248353	3	Columbia Group	Unconfined	WhAEM Model

Table 2b. Delineated Source Water Areas

The individual wellhead protection areas for this system overlap and are displayed on the map as one area

Well Field	Wells	Acreage	Vulnerability
Blades Water	All	35.5	High

Confined wells and wells pumping less than 50,000 gallons per day are delineated using a fixed radius of 150 feet. Wellhead protection areas for public wells screened in an unconfined aquifer that pump 50,000 gallons per day or greater are delineated using a computer model. Wells screened in a semiconfined aquifer are treated as unconfined wells. Because public wells are often constructed with a design capacity greater than the amount of water that will be withdrawn, the design capacity is not used to determine the delineation method.

If the well(s) withdraws 50,000 gallons per day or greater, the well requires an allocation permit. An allocation permit requires the owner submit water use data. This data can be used to determine the rate of withdrawal used in the model.

Blades Water reported using an average of 114,502 gallons of water per day based on water use data from 2013 to 2017, the wellhead protection area for this system was delineated using the geohydrology computer model Wellhead Analytic Element Model (WhAEM). The U. S. EPA developed WhAEM for use in source water assessments (Kraemer, 2010).

Ground water models are computer generated representations of the hydrogeologic system. The modeler builds the modeled system using topographic maps and stream flow data. Good modeling practices require a balance between the realism of the model and the practical limitations of using parameters to generate the resulting ground-water flow model (Kraemer, 2010).

WhAEM 2000 allows the modeler to set parameters to simulate the hydrologic conditions in the study area. These include the amount of precipitation as recharge, aquifer properties, and the duration of time that is being modeled (Table 2c).

Once the model is calibrated, the information about the well including pumping rates, well radius, particles, and release depth are inserted into the model to simulate water withdrawal (Table 2d). Each well at Blades Water was modeled at the rate indicated in Table 2d.

Because of the limitation of the WhAEM model, the delineated wellhead protection area is conservative. It may be larger than a capture zone produced by a more complex model. However, without additional data required for more complex modeling, WhAEM delineations do provide wellhead protection areas that protect the public drinking water supply.

Complete information regarding WhAEM can be found on the EPA website, <http://www.epa.gov/athens/software/whaem/index.html>.

Table 2c. Model Parameters

Property	Value	Units	Reference
Duration	5	years	DNREC, 1999
Recharge	10	inches/yr.	Johnston, 1973
Porosity	0.2	percent	Freeze and Cherry, 1979
Hydraulic Conductivity	110	feet/day	Andres, 1994
Base of Aquifer	72	feet below sea level	Andres and Ramsey, 1995 & McLaughlin et al., 2015

Table 2d. Model Settings

DNREC ID	Pumping Rate (ft³/day)	Well Radius (feet)	Number of Particles	Release Depth (Elevation)
40024	6,123	4	20	-62
40025	4,855	4	20	-62
248353	4,329	4	20	-61

Vulnerability Determination

The vulnerability is the relative ease that contaminants, if released into a wellhead protection area, could enter a public supply well at concentrations that may affect public health. The vulnerability is determined by reviewing the aquifer characteristics, well integrity, and screen depth. Individual wells are ranked as having low, medium, or high vulnerability (DNREC, 1999). The ranking considers the type of aquifer, hydrogeologic setting, well construction, and geographical setting.

Blades Water uses three wells to provide drinking water to the system. These wells are classified as having a high vulnerability because they are drill to a depth of less than 100 feet and no significant clay layers exist between the ground surface and the well screen. As an unconfined well capable of pumping over 50,000 gallons per day, the wellhead protection areas are delineated using a computer model that simulates ground-water flow.

Existing and Potential Sources of Contamination

The U.S. EPA's Safe Drinking Water Act Amendments of 1996 required States to determine the susceptibility of public drinking water wells to contamination (U.S. EPA, 1996). The two general types of contaminates are discrete sources and non-point sources. Ground water can also contain naturally occurring contaminants.

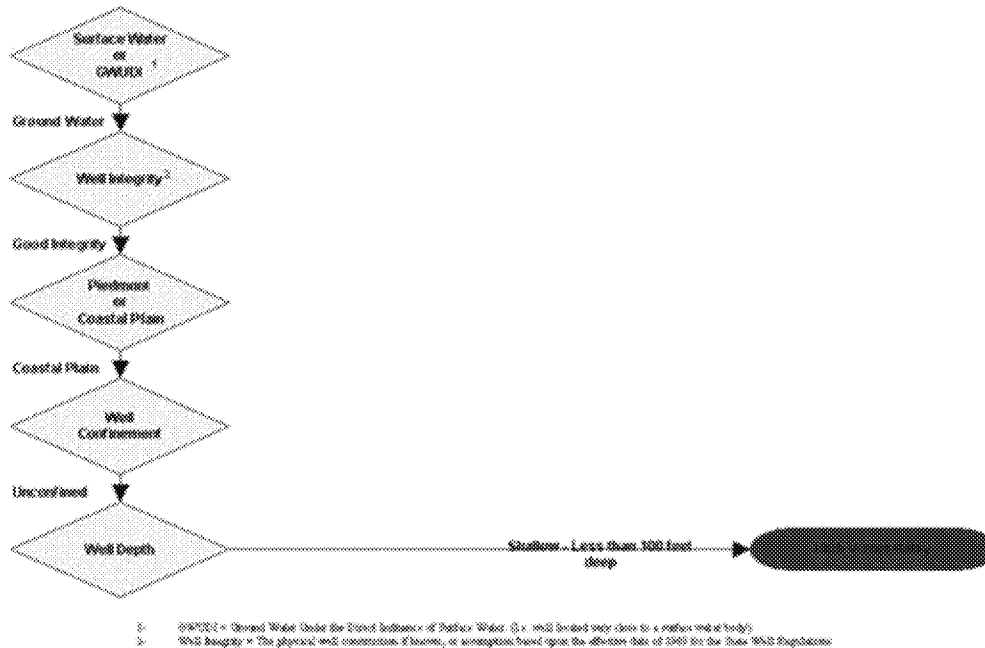


Figure 2. Vulnerability Determination

The vulnerability determination uses a flow diagram based on the well's location, construction, and type of aquifer.

Discrete Sources

Discrete sources of contamination originate from an identifiable source. Examples of discrete sources are large on-site septic facilities or underground storage tanks (Table 3). The inventory of facilities that produce discrete sources of contamination is a product of DNREC's *Whole Basin Assessment Reports* (DNREC, 1998, 2001a, 2001b, and 2005). These datasets are routinely updated.

Table 3. Types of Discrete Sources of Contamination

Discrete sources of contamination are generated or manufactured from an identifiable source. The contamination released from these discrete sources may occur at concentrations that can be quantified.

Underground Storage Tanks	Large On-Site Septic
Landfills/Dumps	Wastewater Spray Irrigation
National Pollutant Discharge Elimination System	Hazardous Waste Generators
State and Federal Superfund Sites	Waste Sludge Application
Animal Feedlot Operations	Combined Sewer Overflows
Tire Piles	Dredge Spoils
Toxic Release Inventory	Domestic Septic Systems
Pesticide Loading, Mixing, & Storage Facility	Salvage Yards

The facility type determines the contaminant potential rating for a discrete source contaminant. Discrete source contaminants enter aquifers by infiltration through the ground. They enter the drinking water supply when they are drawn into wells. The Source Water Assessment rates the contamination potential from discrete sources as, negligible, low, medium, or high. Discrete sources of potential contamination were determined for the wellhead protection areas for the wells at Blades Water.

Current data indicates that there is an underground storage tank within the wellhead protection area for Blades Water. It is identified as Continental Baking Company (MAPID: UT5235) (Appendix A, Map 3). This site has a negligible contaminant potential for nutrients, pathogens, petroleum hydrocarbons, pesticides, PCBs, other organic compounds, metals, and other inorganic compounds (Appendix B, Table 7).

Current data indicates that there is Super Fund Site within the wellhead protection area for Blades Water. It is identified as Peninsula Plating (MAPID: SF6833) (Appendix A, Map 3). This site is currently under investigation and as of this publication is unranked (Appendix B, Table 7)

Non-Point Source Contamination

Non-point source contamination is generated from land use activities and natural processes (Figure 3). They do not have an identifiable point where they enter the water. Like discrete source contaminants, non-point source contaminants enter ground water by infiltrating the land surface.

By analyzing aerial images, tables were generated to rate contaminant potential for land uses and land covers. The Land Use and Land Cover tables (Anderson et al., 1976) evaluate the probability that one or more of these non-point source contaminants will be present or generated by the associated land use or cover. This contamination potential is rated as, negligible, low, medium, or high. The individual contaminant potential based on land use was determined for each well.

Based on the 2007 Land Use and Land Cover (Appendix A, Map 4), approximately 60 percent of the total wellhead protection area for the system contains combined urban land use and 15 percent animal operations (CAFOs). Approximately 12 percent is commercial and 9 percent wetlands. Approximately 2.5 percent is residential with cropland and forested less than 1 percent (Figure 3).

The contaminant potential from combined urban land use within the wellhead protection area for Blades Water is medium for petroleum hydrocarbons, pesticides and other organic compounds. There is a negligible contaminant potential for nutrients, pathogens, PCBs, metals and other inorganic compounds (Appendix B, Table 9).

The contaminant potential from animal operations (CAFOs) land use within the wellhead protection area for Blades Water is medium for nutrients and pathogens. It has a negligible contaminant potential for petroleum hydrocarbons, pesticides, PCBs, other organic compounds, metals and other inorganic compounds (Appendix B, Table 9).

The contaminant potential from commercial land use within the wellhead protection area for Blades Water is medium for nutrients, petroleum hydrocarbons, pesticides, PCBs, other organic compounds, metals and other inorganic compounds. It has a negligible contaminant potential for pathogens (Appendix B, Table 9).

The contaminant potential from wetlands land cover within the wellhead protection area for Blades Water is negligible for nutrients, pathogens, petroleum hydrocarbons, pesticides, PCBs, other organic compounds, metals and other inorganic compounds (Appendix B, Table 9).

The contaminant potential from residential land cover within the wellhead protection area for Blades Water is medium for nutrients, pathogens, petroleum hydrocarbons and pesticides. There is a negligible contaminant potential for PCBs, other organic compounds, metals and other inorganic compounds (Appendix B, Table 9).

The contaminant potential from cropland land use within the wellhead protection area for Blades Water is high for nutrients. There is a medium contaminant potential for pesticides and other inorganic compounds. It has a negligible contaminant potential for pathogens, petroleum hydrocarbons, PCBs, other organic compounds, metals (Appendix B, Table 9).

The contaminant potential from forested land cover within the wellhead protection area for Blades Water is low for pesticides. There is a negligible contaminant potential for nutrients, pathogens, petroleum hydrocarbons, PCBs, other organic compounds, metals and other inorganic compounds (Appendix B, Table 9).

The contaminant potential from all land use within the wellhead protection area for Blades Water is high for nutrients and medium for pathogens, petroleum hydrocarbons, pesticides, PCBs, other organic compounds, metals and other inorganic compounds. (Appendix B, Table 10).

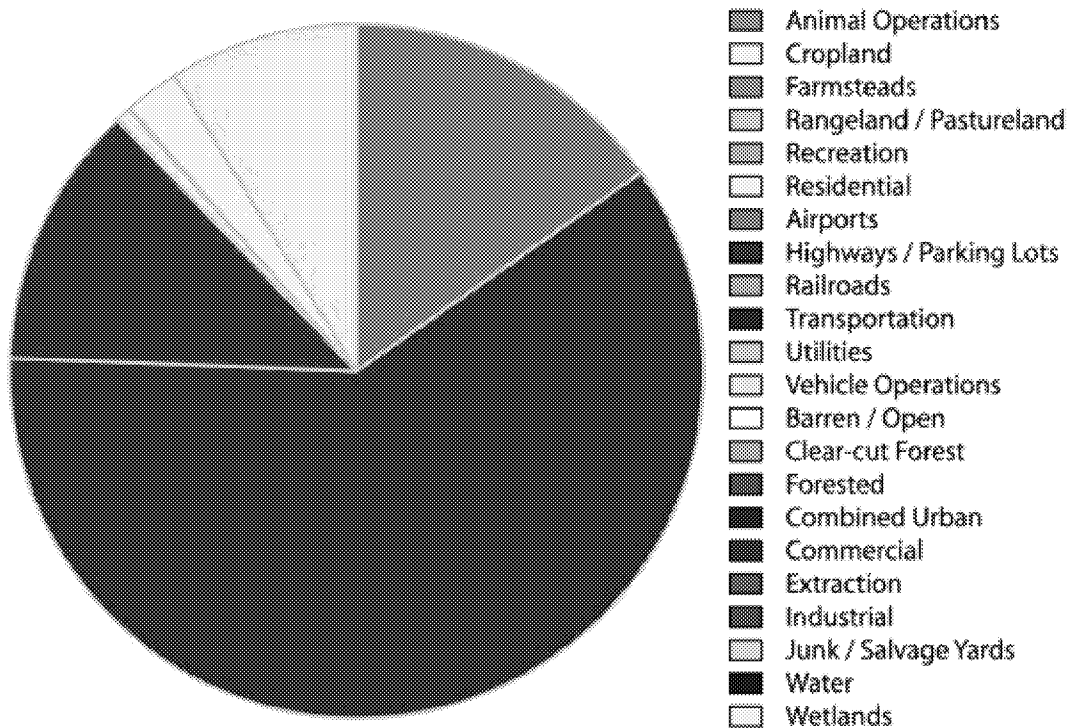


Figure 3. Land Use in Wellhead Protection Area

Land Use is determined by evaluating aerial images projected in Geographic Imaging Systems software programs. Land use tables are used to determine the contaminant potential associated with each land use category.

Roads and Railroads

Roads and railroads are potential sources of contaminants. Maintenance of these thoroughfares such as salting, herbicide application, or a release of toxic materials could affect water quality. In addition, the operation of improperly maintained vehicles may deposit contaminants on these surfaces.

There were 1.48 miles roadways identified within Blades Water wellhead protection area (Table 4, Map 3).

Table 4. Roads and Railways found within the Wellhead Protection Area

Well	Conduit	Miles
40024	Road	1.48
40025	Road	1.48
248353	Road	1.48

Water Quality

DPH-ODW tests raw ground water samples to determine the quality of the drinking water (DHSS, 2002). Raw water samples are taken before the water is treated. These results are referred to as analytical data. The DPH-ODW uses guidelines established by the EPA and State Regulations to set drinking water standards. These standards set a Maximum Contaminant Level (MCL) for each contaminant (EPA, 1996).

The State of Delaware identifies “contaminants of concern” as regulated substances with primary and secondary maximum contaminant levels and unregulated substances as listed in The State of Delaware Regulations Governing Public Drinking Water Systems dated, March 31, 1991 or as later revised (DNREC, 1999).

Delaware has also adopted State drinking water standards for several contaminants that are more protective than Primary and Secondary National and a Health Advisory Level for sodium. The associated MCL is considered the Drinking Water Standard. Any change in the MCL designation by the EPA or the DPH-ODW is incorporated into the source water assessments (DNREC, 1999). In the table heading for analytical data the distinction between Primary National Drinking Water Standard, Secondary National Drinking Water Standard, Health Advisory Level, and State of Delaware Drinking Water Standards is stated and the analyte is noted accordingly.

Enforcement of water quality standards is the responsibility of DPH-ODW. The primary focus of DPH-ODW is to assure that finished water meets the Drinking Water Standards. Public water providers use treatment methods to achieve compliance. Examples of treatment methods include, but not limited to, filtration, disinfection, fluoridation, and softening.

The DNREC Source Water Assessment and Protection Program is responsible for evaluating raw water to determine the possible sources of contaminants. By evaluating what types of contaminants and their concentrations, public water providers can determine if a problem exists and what treatment method to use to improve the quality of water they provide.

Naturally Occurring Contaminants

Several naturally occurring potential contaminants may be identified as part of the Source Water Assessment. These include iron, chloride, sodium, radon, radium, manganese, arsenic, and sulfate.

Analytical Data

The DPH-ODW analytical database was queried for raw/untreated water quality data for the past five years. The data for well 40024 showed concentrations of manganese exceeded the Secondary National Drinking Water Standard. The data showed concentrations of sodium exceeded the Health Advisory Level. The data showed concentrations of perfluorooctanoic acid (PFOA) of 102 ng/L. The United States Environmental Protection Agency has issued a Health Advisory Level of 70 ng/L. However, at the time of this publication PFOA is not a regulated contaminant (Appendix C, Table 13).

The data for well 40025 showed concentrations of manganese were greater than one-half the Secondary National Drinking Water Standard. The data showed concentrations of PFOA of 82.6 ng/L. The United States Environmental Protection Agency has issued a Health Advisory Level of 70 ng/L. However, at the time of this publication PFOA is not a regulated contaminant (Appendix C, Table 13).

The data for well 248353 showed concentrations of cadmium, radium-226 and radium-228 exceeded the Primary National Drinking Water Standard. Concentrations of nitrate were greater than one-half the Primary National Drinking Water Standard.

The data also showed units of pH in well 248353 exceeded the Secondary National Drinking Water Standard. Concentrations of aluminum and manganese were greater than one-half the Secondary National Drinking Water Standard. The data showed concentrations of nickel were greater than one-half the State of Delaware Drinking Water Standards (Appendix C, Table 13).

The data for well 248353 showed concentrations of PFOA of 172 ng/L. The United States Environmental Protection Agency has issued a Health Advisory Level of 70 ng/L. However, at the time of this publication PFOA is not a regulated contaminant (Appendix C, Table 13).

Water Treatment Methods

The DHSS Office of Drinking Water regulates water quality. They sample both raw and finished drinking water produced by public wells. Systems can treat raw water to reduce or remove contaminants. Treatment methods include filtering, softening, disinfection, and ion exchange. Treated water is considered finished water. This assessment focuses on the untreated, raw ground water source water.

Blades Water uses hypochlorination for disinfection, filtration and permanganate to remove iron, a pH adjustment to inhibit corrosion and adds fluoride. The system also uses carbon filtration to remove PFOA.

The quality of water delivered to the consumer is monitored by DPH-ODW. Community systems are required to supply their customers with a Consumer Confidence Reports. For more information about the water treatment used please, contact Blades Water or the DPH-ODW at (302) 741-8630.

Susceptibility Determination

The vulnerability examines the public supply well's construction and geographic location. The susceptibility rating evaluates the possibility that that public supply well might draw contaminated water at concentrations of concern to public health. The susceptibility rating is determined by reviewing the vulnerability of the well, the discrete source contaminant inventory, land use contaminant potential, and the analytical data.

The Delaware Source Water Assessment and Protection Program identify eight classes of contaminants (Table 5). The susceptibility determinations are ranked on a scale of no susceptibility, very low, low, medium, high, very high, and exceeds drinking water standards (DNREC, 1999).

Contaminant Inventory

There are two discrete sources of potential contamination in the wellhead protection areas for Blades Water public water system. These discrete sources may have elevated contaminant potentials that may affect the drinking water. As one discrete source is unranked, the contaminant potential from the ranked discrete sources is negligible for nutrients, pathogens, petroleum hydrocarbons, pesticides, PCBs, other organic, metals, and other inorganic. There is a low contaminant potential for nutrients (Appendix B, Table 8).

The contaminant potential from all land use and land cover within the Blades Water wellhead protection area is high for nutrients and medium for pathogens, petroleum hydrocarbons, pesticides, PCB, other organic compounds, metals and other inorganic compounds (Appendix B, Table 11).

Table 5. Contaminant Classes

The Delaware Source Water Assessment and Protection Program identify eight classes of contaminants. The grouping of contaminants in classes presents a simpler method to determine the susceptibility rating.

Contaminant Class	Examples
Nutrients	Nitrate, Nitrite
Pathogens	Coliform Bacteria, Cryptosporidium, Giardia
Petroleum Hydrocarbons	Gasoline, Heating Oil, Benzene, Toluene
Pesticides	Alachlor, Atrazine, Glyphosate
Polychlorinated Biphenyls	PCB
Other Organic Compounds	Vinyl Chloride, PCE, TCE
Metals	Copper, Arsenic, Iron, Manganese
Other Inorganic Compounds	Fluoride, Chloride, pH, Sulfate

Contaminant Inventory

There are two discrete sources of potential contamination in the wellhead protection areas for Blades Water public water system. These discrete sources may have elevated contaminant potentials that may affect the drinking water. As one discrete source is unranked, the contaminant potential from the ranked discrete sources is negligible for nutrients, pathogens, petroleum hydrocarbons, pesticides, PCBs, other organic, metals, and other inorganic. There is a low contaminant potential for nutrients (Appendix B, Table 8).

The contaminant potential from all land use and land cover within the Blades Water wellhead protection area is high for nutrients and medium for pathogens, petroleum hydrocarbons, pesticides, PCB, other organic compounds, metals and other inorganic compounds (Appendix B, Table 11).

Water Quality and Susceptibility

According to the Source Water Assessment Plan, susceptibility ratings require adjustment if the analytical data finds levels of a contaminant equal to, or greater than one-half the maximum contaminant level (MCL).

The metals susceptibility rating was adjusted for well 40024 because the concentration of manganese exceeded the National Secondary Drinking Water Standards and the concentration of sodium exceeded the Health Advisory Level. The susceptibility rating for other organics was not adjusted because PFAS is not a regulated contaminant (Appendix C, Table 12).

The metals susceptibility rating was adjusted for well 40025 because the concentration of manganese were greater than one-half the National Secondary Drinking Water Standards. The susceptibility rating for other organics was not adjusted because PFOS is not a regulated contaminant (Appendix C, Table 12).

The nutrient susceptibility rating was adjusted for well 248353 because the concentration of nitrate was greater than one-half the Primary National Drinking Water Standards. The metals susceptibility rating was adjusted because the concentration of cadmium exceeded the Primary National Drinking Water Standards.

The other organic compounds susceptibility rating was adjusted for well 248353 because the pH exceeded the National Secondary Drinking Water Standards.

The metals susceptibility rating was adjusted for well 248353 because the concentration of because the concentration of manganese exceeded the National Secondary Drinking Water Standards. The concentration of aluminum were greater than one-half the National Secondary Drinking Water Standards and the concentration of nickel was greater than one-half the State of Delaware Drinking Water Standards (Appendix C, Table 12).

In addition, the levels of Radium-226 and 228 exceeded the Primary National Drinking Water Standards. The susceptibility rating for other organics was not adjusted because PFOS is not a regulated contaminant (Appendix C, Table 12).

Individual Susceptibility

The wells at Blades Water have different characteristics. They vary in depth, location, date drilled, and pumping rate. These differences influence the delineation of the wellhead protection area, the vulnerability determination, and the contaminant inventory. This water system has one combined wellhead protection area for the system.

A Susceptibility Assessment was performed for each wellhead protection area. Each source of contaminant (discrete, land use, or analytical data) was rated according to its contaminant class. The well's vulnerability determination is also considered. The

susceptibility for each wellhead protection area was ranked by the highest source contaminant's susceptibility.

The wellhead protection area for well 40024 is exceedingly susceptible to metals based on the analytical data. It has a very high susceptibility rating for nutrients and a high susceptibility for pathogens, petroleum hydrocarbons, pesticides, PCBs, other organic compounds, metals and other inorganic compounds based on land use activities (Appendix B, Table 12).

The wellhead protection area for well 40024 has a very high susceptibility rating metals based on the analytical data. It has a very high susceptibility rating for nutrients and a high susceptibility for pathogens, petroleum hydrocarbons, pesticides, PCBs, other organic compounds and other inorganic compounds based on land use activities (Appendix B, Table 12).

The wellhead protection area for well 248353 is exceedingly susceptible to metals and other inorganic compounds based on the analytical data. It has a very high susceptibility rating for nutrients based on the analytical data. It has a high susceptibility for pathogens, petroleum hydrocarbons, pesticides, PCBs and other organic compounds based on land use activities (Appendix B, Table 12).

System Susceptibility

Within a public drinking water system, each well could have a different susceptibility rating. The system susceptibility ranks the wells as a group. Blades Water is exceedingly susceptible metals and other inorganic compounds. It has a very high susceptibility rating for nutrients and a high susceptibility for pathogens, petroleum hydrocarbons, pesticides, PCBs and other organic compounds (Table 6).

Table 6. System Susceptibility Rating

The system susceptibility ranks the wells as a group. An individual well can dramatically raise a system's rating.

Susceptibility	Contaminant Class
Exceeds	Metals Other Inorganic Compounds
Very High	Nutrients
High	Pathogens Petroleum Hydrocarbons Pesticides PCBs Other Organic Compounds

Summary

The Delaware Department of Natural Resources and Environmental Control's (DNREC) Division of Water Resources has completed the Source Water Assessment for the public water supply wells for Blades Water. This Assessment is required under the 1996 amendments to the Safe Drinking Water Act. The compiling of this assessment followed the methods specified in the State of Delaware Source Water Assessment Plan (DNREC, 1999).

Blades Water uses three wells to provide drinking water to the system. These wells are classified as having a high vulnerability because they are drill to a depth of less than 100 feet and no significant clay layers exist between the ground surface and the well screen. As an unconfined well capable of pumping over 50,000 gallons per day, the wellhead protection areas are delineated using a computer model that simulates ground-water flow.

This public water supply system provides water to an average daily population of 1,200 residential consumers from January 1 to December 31 through 468 residential service connections.

Current data indicates that there is an underground storage tank within the wellhead protection area for Blades Water. This site has a negligible contaminant potential for nutrients, pathogens, petroleum hydrocarbons, pesticides, PCBs, other organic compounds, metals, and other inorganic compounds. In addition, current data also indicates that there is Super Fund Site within the wellhead protection area for Blades Water. This site is currently under investigation and as of this publication is unranked.

Based on the 2007 Land Use and Land Cover (Appendix A, Map 4), approximately 60 percent of the total wellhead protection area for the system contains combined urban land use and 15 percent animal operations (CAFOs). Approximately 12 percent is commercial and 9 percent wetlands. Approximately 2.5 percent is residential with cropland and forested less than 1 percent.

The DPH-ODW analytical database was queried for raw/untreated water quality data for the past five years. The data for well 40024 showed concentrations of manganese exceeded the Secondary National Drinking Water Standard. The data showed concentrations of sodium exceeded the Health Advisory Level. The data showed concentrations of perfluorooctanoic acid (PFOA) of 102 ng/L. The United States Environmental Protection Agency has issued a Health Advisory Level of 70 ng/L. However, at the time of this publication PFOA is not a regulated contaminant (Appendix C, Table 13).

The data for well 40025 showed concentrations of manganese were greater than one-half the Secondary National Drinking Water Standard. The data showed concentrations of PFOA of 82.6 ng/L. The United States Environmental Protection Agency has issued a Health Advisory Level of 70 ng/L. However, at the time of this publication PFOA is not a regulated contaminant.

The data for well 248353 showed concentrations of cadmium, radium-226 and radium-228 exceeded the Primary National Drinking Water Standard. Concentrations of nitrate were greater than one-half the Primary National Drinking Water Standard.

The data also showed concentrations of aluminum, manganese and pH for well 248353 were greater than one-half the Secondary National Drinking Water Standard. The data showed concentrations of nickel were greater than one-half the State of Delaware Drinking Water Standards.

The data for well 248353 showed concentrations of PFOA of 172 ng/L. The United States Environmental Protection Agency has issued a Health Advisory Level of 70 ng/L. However, at the time of this publication PFOA is not a regulated contaminant.

Within a public drinking water system, each well could have a different susceptibility rating. The system susceptibility ranks the wells as a group. Blades Water is exceedingly susceptible metals and other inorganic compounds. It has a very high susceptibility rating for nutrients and a high susceptibility for pathogens, petroleum hydrocarbons, pesticides, PCBs and other organic compounds.

References

- Anderson, J. R., Hardy, E. E., Roach, J. T., and Witmer, R. E., 1976, A Land Use and Land Cover Classification System for Use with Remote Sensor Data, Geological Survey Professional Paper 964: Washington, D.C., U.S. Gov. Printing Office, p. 41
- Andres, A. S., and Ramsey, K. W., 1995, Geology of the Seaford Area, Delaware: Delaware Geological Survey, Geologic Map Series No. 9, scale 1:24,000.
- Delaware Department of Natural Resources and Environmental Control. (1999). The State of Delaware Source Water Assessment Plan: Dover, DE, p. 301.
- Delaware Department of Natural Resources and Environmental Control. (1998, 2001a, 2001b, and 2005). Whole Basin Assessment Reports. [Electronic Version] Retrieved January 5, 2009, from <http://www.dnrec.delaware.gov/wholebasin>
- DHSS-Office of Drinking Water, Div. of Public Health, 2002, State of Delaware Regulations Governing Public Drinking Water Systems: Dover, DE, Division of Public Health, p. 155.
- EPA -United States Environmental Protection Agency. (1996). Safe Drinking Water Contaminants, EPA 816-F-09-0004 [Electronic Version]. Retrieved June 2010, from <http://www.epa.gov/safewater/contaminants/index.html>
- EPA -United States Environmental Protection Agency. (1996). Safe Drinking Water Act Retrieved May 2010, from <http://www.epa.gov/safewater/sdwa/>
- EPA –United States Environmental Protection Agency. (1997). State Source Water Assessment and Protection Programs Guidance: Final Guidance, EPA 816-R-97-009 [Electronic Version]. Retrieved May 4, 2010, from <http://www.epa.gov/safewater/sourcewater/pubs/swpguidance.pdf>.
- EPA –United States Environmental Protection Agency. (1974). Summary of the Safe Drinking Water Act: 42 U.S.C. §300f et seq. (1974) [Electronic Version]. Retrieved May 4, 2010, from <http://www.epa.gov/lawsregs/laws/sdwa.html>
- Kraemer, S.R., Haitjema, H.M., and Kelson, V.A., 2010, Working with WhAEM 2000: Washington, DC, Office of Research and Development, 79 p.
- McLaughlin, P. P., Tomlinson, J. L., and Lawson, A. L., 2015, Aquifers and Groundwater Withdrawals, Kent and Sussex Counties, Delaware, Contract Report for Delaware Department Natural Resources and Environmental Control, Water Division, Water, Water Supply, Delaware Geological Survey, p. 127.

- Ramsey, K. W., and Tomlinson, J. L., 2014, Geological Map of the Sharptown, Laurel, Hebron, and Delmar Quadrangles, Delaware: Delaware Geological Survey, Geologic Map Series No. 22, scale 1:24,000.
- Walker, J.D., and Geissman, J.W., compilers, 2009, Geologic Time Scale: The Geological Society of America, doi:10.1130/2009.CTS004R2C.

Appendix A. Maps

Ex. 9 Wells

Base Legend

Source Location

Well

Roads

Major
Primary
Secondary

Railroads

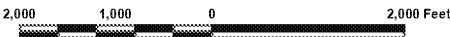
Main Lines and Sidings

Political Boundaries

CPCN Area



DNREC ID	LOCAL ID	DATE DRILLED	CAPACITY (gpm)	DIAMETER (inches)	SCREEN INTERVAL (feet)	AQUIFER
40024	1	1978-06-28	150	8	66 - 96	Columbia Group
40025	2	1978-06-28	150	8	66 - 96	Columbia Group
248353	3	2014-12-15	150	8	65 - 90	Columbia Group



1:24,000

Ex. 9 Wells

Digital Aerial Solutions, LLC

Vulnerability and Delineation

Well Vulnerability

- High
- Medium
- Low

Delineated Boundaries

Wellhead Protection Area

DNREC ID	LOCAL ID	DEPTH(feet)	AQUIFER	AQUIFER TYPE	DELINEATION TYPE	VULNERABILITY
40024	1	96	Columbia Group	Unconfined	150' Fixed Radius	High
40025	2	96	Columbia Group	Unconfined	150' Fixed Radius	High
248353	3	90	Columbia Group	Unconfined	150' Fixed Radius	High



1:4,800



DISCLAIMER: This map depicts data compiled by the DNR's Source Water Assessment Program as of the date shown in the upper right and may not depict the most current conditions. The information contained on this sheet is a portion of that which was reported in the Source Water Assessment Report for this particular public water supply system.



Discrete Sources

Contaminant Potential

Outside of Area Low Medium High

Site Types

A Animal Operations
K Combined Sewer Overflows
9 Domestic Septic System
9 Dredge Spoils
Q Hazardous Waste Generator
Q Landfills
Q Large Septic System
& NPDES

W Pesticide Loading, Mixing, Storage
+ Superfund
> Salvage Yards
G Sludge Application
" Spray Irrigation
" Toxic Release Inventory
, Tire Pile
5 Underground Storage Tank

Sites with Large Areal Extent

Landfills Golf Courses

GMZs

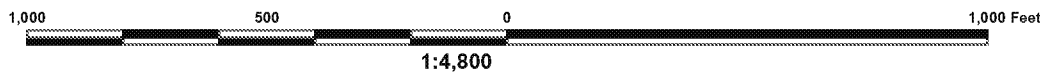
1 Zone
Zone A
Zone B

Sussex County Landfills

No Wells Permitted
Zone A (Wells < 10 gpm)
Zone B (Wells < 100 gpm)

Contaminant Potential from Discrete Sources within Source Water Area

Map ID	SITE ID	SITE TYPE	SITE NAME	NUTRIENTS	PATHOGENS	PETROLEUM	HYDROCARBON	PESTICIDES	PCBs	OTHER ORGANICS	METALS	OTHER INORGANICS
UT5325	1-000388	UST	Continental Bakery Co.	NEG.	NEG.	NEG.	NEG.	NEG.	NEG.	NEG.	NEG.	NEG.
SF6833	DE-0287	SFS	Peninsula Plating	*****UNRANKED*****								



MAP 4 - Land Use Map for Blades Water

Page 35 of 59
2018-06-20



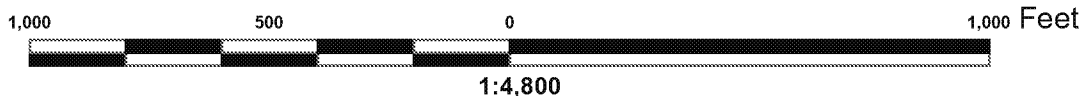
DISCLAIMER: This map depicts data compiled by the DNREC's Source Water Assessment Program as of the date shown in the upper right and may not depict the most current conditions. The information contained on this sheet is a portion of that which was reported in the Source Water Assessment Report for this particular public water supply system.

Land Use / Land Cover (2007)

- | | |
|-------------------------------------|--|
| Agricultural | Undeveloped |
| CAFOs | Barren / Open |
| Cropland | Clear-cut Forest |
| Farmsteads | Forested |
| Rangeland / Pastureland | Urban, Commercial, and Industrial |
| Residential and Recreational | Combined Urban |
| Recreation | Commercial |
| Residential | Extraction |
| Transportation and Utilities | Industrial |
| Airports | Junk / Salvage Yards |
| Highways / Parking Lots | Water Related |
| Railroads | Water |
| Transportation | Wetlands |
| Utilities | |
| Vehicle Operations | |

Contaminant Potential from System-Wide Land Use

LAND USE / LAND COVER	AREA (acres)	PERCENT	NUTRIENTS	PATHOGENS	PETROLEUM	HYDROCARBON	PESTICIDES	PCBs	OTHER ORGANICS	METALS	OTHER INORGANICS
Combined Urban	21.44	60.26	NEG.	NEG.	MED.	MED.	NEG.	MED.	NEG.	NEG.	NEG.
CAFOs	5.44	15.3	MED.	MED.	NEG.	NEG.	NEG.	NEG.	NEG.	NEG.	NEG.
Commercial	4.38	12.32	MED.	NEG.	MED.	MED.	MED.	MED.	MED.	MED.	MED.
Wetland	3.14	8.84	NEG.	NEG.	NEG.	NEG.	NEG.	NEG.	NEG.	NEG.	NEG.
Residential	0.88	2.47	MED.	MED.	MED.	MED.	NEG.	NEG.	NEG.	NEG.	NEG.
Cropland	0.26	0.75	HIGH	NEG.	NEG.	MED.	NEG.	NEG.	NEG.	NEG.	MED.
Forested	0.01	0.03	NEG.	NEG.	NEG.	LOW	NEG.	NEG.	NEG.	NEG.	NEG.



Appendix B. Tables

Table 7. Contaminant Potential from Individual Types of Discrete Sources by WHPA

DNREC stores information of known discrete sources of contamination in databases. This information is accessed and used to rate the contaminant potential from each source. The contaminant potential is rated for each of the eight-contaminant classes. It is reported as negligible (NEG), LOW, medium (MED.), and HIGH for each wellhead protection area.

Wellhead Protection Area	Discrete Sources	Site ID	Nutrients	Pathogens	Petroleum Hydrocarbons	Pesticides	PCBs	Other Organic Compounds	Metals	Other Inorganic Compounds
40024	Underground Storage Tanks	5-000075	NEG.	NEG.	NEG.	NEG.	NEG.	NEG.	NEG.	NEG.
40025	Underground Storage Tanks	5-000075	NEG.	NEG.	NEG.	NEG.	NEG.	NEG.	NEG.	NEG.
248353	Underground Storage Tanks	5-000075	NEG.	NEG.	NEG.	NEG.	NEG.	NEG.	NEG.	NEG.
40024	Super Fund Sites	DE-0287	Unranked	Unranked	Unranked	Unranked	Unranked	Unranked	Unranked	Unranked
40025	Super Fund Sites	DE-0287	Unranked	Unranked	Unranked	Unranked	Unranked	Unranked	Unranked	Unranked
248353	Super Fund Sites	DE-0287	Unranked	Unranked	Unranked	Unranked	Unranked	Unranked	Unranked	Unranked

Table 8. Contaminant Potential from Total Discrete Sources by System

DNREC stores information of known discrete sources of contamination in databases. This information is accessed and used to rate the contaminant potential from each source. The contaminant potential is rated for each of the eight-contaminant classes. It is reported as negligible (NEG), LOW, medium (MED.), and HIGH for the system.

System Summary	Nutrients	Pathogens	Petroleum Hydrocarbons	Pesticides	PCBs	Other Organic Compounds	Metals	Other Inorganic Compounds
Overall	NEG.	NEG.	NEG.	NEG.	NEG.	NEG.	NEG.	NEG.

Table 9. Contaminant Potential from Each Land Use within WHPA

DNREC identifies land use from aerial images. Each land use has specific contaminants associated with it. The contaminant potential is rated for each of the eight-contaminant classes. It is reported as negligible (NEG), LOW, medium (MED.), and HIGH for each wellhead protection area.

WHPA	Land Use	Area (acres)	Percent	Nutrients	Pathogens	Petroleum Hydrocarbons	Pesticides	PCBs	Other Organic Compounds	Metals	Other Inorganic Compounds
40024	Combined Urban	21.44	60.26	NEG.	NEG.	MED.	MED.	NEG.	MED.	NEG.	NEG.
40024	CAFOs	5.44	15.3	MED.	MED.	NEG.	NEG.	NEG.	NEG.	NEG.	NEG.
40024	Commercial	4.38	12.32	MED.	NEG.	MED.	MED.	MED.	MED.	MED.	MED.
40024	Wetland	3.14	8.84	NEG.	NEG.	NEG.	NEG.	NEG.	NEG.	NEG.	NEG.
40024	Residential	0.88	2.47	MED.	MED.	MED.	MED.	NEG.	NEG.	NEG.	NEG.
40024	Cropland	0.26	0.75	High	NEG.	NEG.	MED.	NEG.	NEG.	NEG.	MED.
40024	Forested	0.01	0.03	NEG.	NEG.	NEG.	LOW	NEG.	NEG.	NEG.	NEG.
40025	Combined Urban	21.44	60.26	NEG.	NEG.	MED.	MED.	NEG.	MED.	NEG.	NEG.
40025	CAFOs	5.44	15.3	MED.	MED.	NEG.	NEG.	NEG.	NEG.	NEG.	NEG.
40025	Commercial	4.38	12.32	MED.	NEG.	MED.	MED.	MED.	MED.	MED.	MED.
40025	Wetland	3.14	8.84	NEG.	NEG.	NEG.	NEG.	NEG.	NEG.	NEG.	NEG.
40025	Residential	0.88	2.47	MED.	MED.	MED.	MED.	NEG.	NEG.	NEG.	NEG.
40025	Cropland	0.26	0.75	High	NEG.	NEG.	MED.	NEG.	NEG.	NEG.	MED.
40025	Forested	0.01	0.03	NEG.	NEG.	NEG.	LOW	NEG.	NEG.	NEG.	NEG.
248353	Combined Urban	21.44	60.26	NEG.	NEG.	MED.	MED.	NEG.	MED.	NEG.	NEG.

WHPA	Land Use	Area (acres)	Percent	Nutrients	Pathogens	Petroleum Hydrocarbons	Pesticides	PCBs	Other Organic Compounds	Metals	Other Inorganic Compounds
248353	CAFOs	5.44	15.3	MED.	MED.	NEG.	NEG.	NEG.	NEG.	NEG.	NEG.
248353	Commercial	4.38	12.32	MED.	NEG.	MED.	MED.	MED.	MED.	MED.	MED.
248353	Wetland	3.14	8.84	NEG.	NEG.	NEG.	NEG.	NEG.	NEG.	NEG.	NEG.
248353	Residential	0.88	2.47	MED.	MED.	MED.	MED.	NEG.	NEG.	NEG.	NEG.
248353	Cropland	0.26	0.75	High	NEG.	NEG.	MED.	NEG.	NEG.	NEG.	MED.
248353	Forested	0.01	0.03	NEG.	NEG.	NEG.	LOW	NEG.	NEG.	NEG.	NEG.

Table 10. Contaminant Potential from Total Land Use within WHPA

DNREC identifies land use from aerial images. Each land use has specific contaminants associated with it. The contaminant potential is rated for each of the eight-contaminant classes. It is reported as negligible (NEG), LOW, medium (MED.), and HIGH for each wellhead protection area.

WHPA Summary	Land Use	Area(acres)	Nutrients	Pathogens	Petroleum Hydrocarbons	Pesticides	PCBs	Other Organic Compounds	Metals	Other Inorganic Compounds
40024	All	35.55	HIGH	MED.	MED.	MED.	MED.	MED.	MED.	MED.
40025	All	35.55	HIGH	MED.	MED.	MED.	MED.	MED.	MED.	MED.
248353	All	35.55	HIGH	MED.	MED.	MED.	MED.	MED.	MED.	MED.

Table 11. Contaminant Potential from Total Land Use within the System

DNREC identifies land use from aerial images. Each land use has specific contaminants associated with it. The contaminant potential is rated for each of the eight-contaminant classes. It is reported as negligible (NEG), low, medium (MED.), and high for the system.

System Summary	Nutrients	Pathogens	Petroleum Hydrocarbons	Pesticides	PCBs	Other Organic Compounds	Metals	Other Inorganic Compounds
Overall	HIGH	MED.	MED.	MED.	MED.	MED.	MED.	MED.

Table 12. Individual Wellhead Protection Area Susceptibility

The vulnerability determination examines the possibility of a contaminant being drawn into a public drinking water through the well. The susceptibility rating evaluates the probability of a contaminant, if present, could enter the water supply. The susceptibility ratings for each of the eight-contaminant classes are reported as; very low, low, medium (MED.), high, very high, and exceeds standards for each wellhead protection area.

Wellhead Protection Area	Based On	Vulnerability	Nutrients	Pathogens	Petroleum Hydrocarbons	Pesticides	PCBs	Other Organic Compounds	Metals	Other Inorganic Compounds
40024	Discrete Sources	HIGH	LOW	LOW	LOW	LOW	LOW	LOW	LOW	LOW
40024	Land Use	HIGH	VERY HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH
40024	Analytical Data	HIGH	-	-	-	-	-	-	EXCEEDS	-
40024	Overall	HIGH	VERY HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	EXCEEDS	HIGH
40025	Discrete Sources	HIGH	LOW	LOW	LOW	LOW	LOW	LOW	LOW	LOW
40025	Land Use	HIGH	VERY HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH
40025	Analytical Data	HIGH	-	-	-	-	-	-	HIGH	-
40025	Overall	HIGH	VERY HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	VERY HIGH	HIGH
248353	Discrete Sources	HIGH	LOW	LOW	LOW	LOW	LOW	LOW	LOW	LOW
248353	Land Use	HIGH	VERY HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	HIGH
248353	Analytical Data	HIGH	VERY HIGH	-	-	-	-	-	EXCEEDS	EXCEEDS
248353	Overall	HIGH	VERY HIGH	HIGH	HIGH	HIGH	HIGH	HIGH	EXCEEDS	EXCEEDS

Appendix C. Analytical Data

Table 13. Available Analytical Data

The DHSS Office of Drinking Water analyzes water samples for public drinking water systems. They have provided the last five years of data for this assessment. All standards refer to the maximum contaminant limit (MCL) established by the EPA except as noted. National Secondary Drinking Water Standards are noted by *, Health Advisory Limits by **, and State of Delaware Standards by ***.

Contaminant Class	DNREC ID	Contaminant	Sample Date	Result	Standard	Units
Metals	40024	ANTIMONY TOTAL	2013-04-30	< 0.0005	0.006	mg/L
Metals	40024	ARSENIC	2013-04-30	< 0.0005	0.01	mg/L
Metals	40024	BARIUM	2013-04-30	0.1291	1	mg/L
Metals	40024	BERYLLIUM, TOTAL	2013-04-30	< 0.0005	0.004	mg/L
Metals	40024	CADMIUM	2013-04-30	< 0.0005	0.005	mg/L
Metals	40024	CHROMIUM	2013-04-30	0.0026	0.1	mg/L
Metals	40024	COPPER FREE	2013-04-30	0.0015	1	mg/L
Metals	40024	LEAD	2013-04-30	0.0029	0.015	mg/L
Metals	40024	*MANGANESE	2013-04-30	0.0718	0.05	mg/L
Metals	40024	MERCURY	2013-04-30	< 0.0005	0.002	mg/L
Metals	40024	***NICKEL	2013-04-30	0.0031	0.1	mg/L
Metals	40024	SELENIUM	2013-04-30	< 0.01	0.05	mg/L
Metals	40024	THALLIUM, TOTAL	2013-04-30	< 0.0005	0.002	mg/L
Metals	40024	URANIUM-238	2013-04-30	< 0.0005	0.03	mg/L
Metals	40024	ANTIMONY TOTAL	2014-04-23	< 0.0005	0.006	mg/L
Metals	40024	ARSENIC	2014-04-23	< 0.0005	0.01	mg/L
Metals	40024	BARIUM	2014-04-23	0.094	1	mg/L
Metals	40024	BERYLLIUM, TOTAL	2014-04-23	< 0.0005	0.004	mg/L
Metals	40024	CADMIUM	2014-04-23	< 0.0005	0.005	mg/L

Contaminant Class	DNREC ID	Contaminant	Sample Date	Result	Standard	Units
Metals	40024	CHROMIUM	2014-04-23	0.0012	0.1	mg/L
Metals	40024	COPPER FREE	2014-04-23	0.0029	1	mg/L
Metals	40024	LEAD	2014-04-23	0.0017	0.015	mg/L
Metals	40024	*MANGANESE	2014-04-23	0.0877	0.05	mg/L
Metals	40024	MERCURY	2014-04-23	< 0.0005	0.002	mg/L
Metals	40024	***NICKEL	2014-04-23	0.0027	0.1	mg/L
Metals	40024	SELENIUM	2014-04-23	< 0.01	0.05	mg/L
Metals	40024	URANIUM-238	2014-04-23	< 0.0005	0.03	mg/L
Other Inorganics	40024	ALKALINITY TOTAL	2015-06-23	20.9	Unregulated	mg/L
Other Inorganics	40024	*CHLORIDE	2015-06-23	40.1	250	mg/L
Other Inorganics	40024	***FLUORIDE	2015-06-23	< 0.1	2	mg/L
Other Inorganics	40024	*HARDNESS, TOTAL (AS CaCO3)	2015-06-23	39.4	200	mg/L
Metals	40024	*IRON	2015-06-23	0.13	0.3	mg/L
Nutrients	40024	NITRATE	2015-06-23	2.9	10	mg/L
Nutrients	40024	NITRITE	2015-06-23	< 0.1	1	mg/L
Metals	40024	**SODIUM	2015-06-23	24.0	20	mg/L
Other Inorganics	40024	*SULFATE	2015-06-23	20.3	250	mg/L
Other Inorganics	40024	*TDS	2015-06-23	144	500	mg/L
Pathogens	40024	TOTAL COLIFORM	2015-06-23	A	A	CFU
Other Organics	40024	TURBIDITY	2015-06-23	0.17	Unregulated	NTU
Metals	40024	MERCURY	2015-10-19	< 0.0002	0.002	mg/L
Pathogens	40024	TOTAL COLIFORM	2017-06-01	A	A	CFU
Metals	40024	CHROMIUM	2018-01-22	1.3	100	µg/L
Metals	40024	CHROMIUM DISSOLVED	2018-01-22	1.3	100	µg/L
Metals	40024	CHROMIUM VI	2018-01-22	2.7	100	µg/L

Contaminant Class	DNREC ID	Contaminant	Sample Date	Result	Standard	Units
Other Organics	40024	N-ETHYL PERFLUOROOCTANE SULFONAMIDOACETIC ACID (NETFOSAA)	2018-01-22	1.67	Unregulated	ng/L
Other Organics	40024	N-METHYL PERFLUOROOCTANE SULFONAMIDOACETIC ACID (NMEFOSAA)	2018-01-22	2.72	Unregulated	ng/L
Other Organics	40024	PERFLUOROBUTANESULFONIC ACID (PFBS)	2018-01-22	5.85	Unregulated	ng/L
Other Organics	40024	PERFLUORODECANOIC ACID (PFDA)	2018-01-22	1.11	Unregulated	ng/L
Other Organics	40024	PERFLUORODODECANOIC ACID (PFDOA)	2018-01-22	0.48	Unregulated	ng/L
Other Organics	40024	PERFLUOROHEPTANOIC ACID (PFHPA)	2018-01-22	6.07	Unregulated	ng/L
Other Organics	40024	PERFLUOROHXANESULFONIC ACID (PFHXS)	2018-01-22	23.5	Unregulated	ng/L
Other Organics	40024	PERFLUOROHXANOIC ACID (PFHXA)	2018-01-22	11.9	Unregulated	ng/L
Other Organics	40024	PERFLUORONONANOIC ACID (PFNA)	2018-01-22	33.4	Unregulated	ng/L
Other Organics	40024	PERFLUOROOCTANESULFONIC ACID (PFOS)	2018-01-22	102	Unregulated	ng/L
Other Organics	40024	PERFLUOROOCTANOIC ACID (PFOA)	2018-01-22	15.5	Unregulated	ng/L
Other Organics	40024	PERFLUOROTETRADECANOIC ACID (PFTEA)	2018-01-22	0.25	Unregulated	ng/L
Other Organics	40024	PERFLUOROTRIDECANOIC ACID (PFTRIA)	2018-01-22	1.14	Unregulated	ng/L
Other Organics	40024	PERFLUOROUNDECANOIC ACID (PFUNA)	2018-01-22	0.96	Unregulated	ng/L
Metals	40025	ANTIMONY TOTAL	2013-04-30	< 0.0005	0.006	mg/L
Metals	40025	ARSENIC	2013-04-30	< 0.0005	0.01	mg/L
Metals	40025	BARIUM	2013-04-30	0.0975	1	mg/L
Metals	40025	BERYLLIUM, TOTAL	2013-04-30	< 0.0005	0.004	mg/L
Metals	40025	CADMIUM	2013-04-30	< 0.0005	0.005	mg/L
Metals	40025	CHROMIUM	2013-04-30	0.0018	0.1	mg/L
Metals	40025	COPPER FREE	2013-04-30	0.0121	1	mg/L
Metals	40025	LEAD	2013-04-30	0.0021	0.015	mg/L
Metals	40025	*MANGANESE	2013-04-30	0.0417	0.05	mg/L
Metals	40025	MERCURY	2013-04-30	< 0.0005	0.002	mg/L
Metals	40025	***NICKEL	2013-04-30	0.0018	0.1	mg/L

Contaminant Class	DNREC ID	Contaminant	Sample Date	Result	Standard	Units
Metals	40025	SELENIUM	2013-04-30	< 0.01	0.05	mg/L
Metals	40025	THALLIUM, TOTAL	2013-04-30	< 0.0005	0.002	mg/L
Metals	40025	URANIUM-238	2013-04-30	< 0.0005	0.03	mg/L
Metals	40025	ANTIMONY TOTAL	2014-04-23	< 0.0005	0.006	mg/L
Metals	40025	ARSENIC	2014-04-23	< 0.0005	0.01	mg/L
Metals	40025	BARIUM	2014-04-23	0.1011	1	mg/L
Metals	40025	BERYLLIUM, TOTAL	2014-04-23	< 0.0005	0.004	mg/L
Metals	40025	CADMIUM	2014-04-23	< 0.0005	0.005	mg/L
Metals	40025	CHROMIUM	2014-04-23	< 0.0005	0.1	mg/L
Metals	40025	COPPER FREE	2014-04-23	0.0011	1	mg/L
Metals	40025	LEAD	2014-04-23	< 0.0005	0.015	mg/L
Metals	40025	*MANGANESE	2014-04-23	0.0343	0.05	mg/L
Metals	40025	MERCURY	2014-04-23	< 0.0005	0.002	mg/L
Metals	40025	***NICKEL	2014-04-23	0.0021	0.1	mg/L
Metals	40025	SELENIUM	2014-04-23	< 0.01	0.05	mg/L
Metals	40025	URANIUM-238	2014-04-23	< 0.0005	0.03	mg/L
Other Inorganics	40025	ALKALINITY TOTAL	2015-06-23	10.9	Unregulated	mg/L
Other Inorganics	40025	*CHLORIDE	2015-06-23	9.4	250	mg/L
Other Inorganics	40025	***FLUORIDE	2015-06-23	< 0.1	2	mg/L
Other Inorganics	40025	*HARDNESS, TOTAL (AS CaCO3)	2015-06-23	23.4	200	mg/L
Metals	40025	*IRON	2015-06-23	< 0.1	0.3	mg/L
Nutrients	40025	NITRATE	2015-06-23	4.7	10	mg/L
Nutrients	40025	NITRITE	2015-06-23	< 0.1	1	mg/L
Metals	40025	**SODIUM	2015-06-23	6.2	20	mg/L
Other Inorganics	40025	*SULFATE	2015-06-23	9.5	250	mg/L

Contaminant Class	DNREC ID	Contaminant	Sample Date	Result	Standard	Units
Other Inorganics	40025	*TDS	2015-06-23	82	500	mg/L
Pathogens	40025	TOTAL COLIFORM	2015-06-23	A	A	CFU
Other Organics	40025	TURBIDITY	2015-06-23	0.06	Unregulated	NTU
Metals	40025	CHROMIUM	2018-01-22	1.3	100	µg/L
Metals	40025	CHROMIUM DISSOLVED	2018-01-22	1.3	100	µg/L
Metals	40025	CHROMIUM VI	2018-01-22	2.7	100	µg/L
Other Organics	40025	N-ETHYL PERFLUOROOCTANE SULFONAMIDOACETIC ACID (NETFOSAA)	2018-01-22	1.7	Unregulated	ng/L
Other Organics	40025	N-METHYL PERFLUOROOCTANE SULFONAMIDOACETIC ACID (NMEFOSAA)	2018-01-22	2.77	Unregulated	ng/L
Other Organics	40025	PERFLUOROBUTANESULFONIC ACID (PFBS)	2018-01-22	5.35	Unregulated	ng/L
Other Organics	40025	PERFLUORODECANOIC ACID (PFDA)	2018-01-22	0.56	Unregulated	ng/L
Other Organics	40025	PERFLUORODODECANOIC ACID (PFDOA)	2018-01-22	0.49	Unregulated	ng/L
Other Organics	40025	PERFLUOROHEPTANOIC ACID (PFHPA)	2018-01-22	4.92	Unregulated	ng/L
Other Organics	40025	PERFLUOROHXANESULFONIC ACID (PFHXS)	2018-01-22	21.8	Unregulated	ng/L
Other Organics	40025	PERFLUOROHXANOIC ACID (PFHXA)	2018-01-22	9.76	Unregulated	ng/L
Other Organics	40025	PERFLUORONONANOIC ACID (PFNA)	2018-01-22	21.5	Unregulated	ng/L
Other Organics	40025	PERFLUOROOCTANESULFONIC ACID (PFOS)	2018-01-22	82.6	Unregulated	ng/L
Other Organics	40025	PERFLUOROOCTANOIC ACID (PFOA)	2018-01-22	13.6	Unregulated	ng/L
Other Organics	40025	PERFLUOROTETRADECANOIC ACID (PFTEA)	2018-01-22	0.26	Unregulated	ng/L
Other Organics	40025	PERFLUOROTRIDECANOIC ACID (PFTRIA)	2018-01-22	1.16	Unregulated	ng/L
Other Organics	40025	PERFLUOROUNDECANOIC ACID (PFUNA)	2018-01-22	0.98	Unregulated	ng/L
Other Organics	248353	1,1,1,2-TETRACHLOROETHANE	2013-04-02	< 0.5	Unregulated	µg/L
Other Organics	248353	1,1,1-TRICHLOROETHANE	2013-04-02	< 0.5	200	µg/L
Other Organics	248353	1,1,2,2-TETRACHLOROETHANE	2013-04-02	< 0.5	Unregulated	µg/L
Other Organics	248353	1,1,2-TRICHLOROETHANE	2013-04-02	< 0.5	5	µg/L
Other Organics	248353	1,1-DICHLOROETHANE	2013-04-02	< 0.5	7	µg/L

Contaminant Class	DNREC ID	Contaminant	Sample Date	Result	Standard	Units
Other Organics	248353	1,1-DICHLOROETHYLENE	2013-04-02	< 0.5	7	µg/L
Other Organics	248353	1,2,3-TRICHLOROBENZENE	2013-04-02	< 0.5	Unregulated	µg/L
Other Organics	248353	1,2,3-TRICHLOROPROPANE	2013-04-02	< 0.5	Unregulated	µg/L
Other Organics	248353	1,2,4-TRICHLOROBENZENE	2013-04-02	< 0.5	70	µg/L
Other Organics	248353	1,2,4-TRIMETHYLBENZENE	2013-04-02	< 0.5	Unregulated	µg/L
Other Organics	248353	1,2-DIBROMO-3-CHLOROPROPANE	2013-04-02	< 0.02	0.2	µg/L
Other Organics	248353	1,2-DICHLOROETHANE	2013-04-02	< 0.5	5	µg/L
Other Organics	248353	1,2-DICHLOROPROPANE	2013-04-02	< 0.5	5	µg/L
Other Organics	248353	1,3,5-TRIMETHYLBENZENE	2013-04-02	< 0.5	Unregulated	µg/L
Other Organics	248353	1,3-DICHLOROPROPANE	2013-04-02	< 0.5	Unregulated	µg/L
Other Organics	248353	2,2-DICHLOROPROPANE	2013-04-02	< 0.5	Unregulated	µg/L
Pesticides	248353	2,4,5-TP	2013-04-02	< 0.5	50	µg/L
Pesticides	248353	2,4-D	2013-04-02	< 1	70	µg/L
Other Inorganics	248353	ALKALINITY CaCO3 STABILITY	2013-04-02	3	Unregulated	mg/L
Metals	248353	*ALUMINUM	2013-04-02	0.0189	0.05 - 0.2	mg/L
Metals	248353	ANTIMONY TOTAL	2013-04-02	< 0.002	0.006	mg/L
PCBs	248353	AROCLOR 1016	2013-04-02	< 0.49	0.5	µg/L
PCBs	248353	AROCLOR 1221	2013-04-02	< 0.49	0.5	µg/L
PCBs	248353	AROCLOR 1232	2013-04-02	< 0.49	0.5	µg/L
PCBs	248353	AROCLOR 1242	2013-04-02	< 0.49	0.5	µg/L
PCBs	248353	AROCLOR 1248	2013-04-02	< 0.49	0.5	µg/L
PCBs	248353	AROCLOR 1254	2013-04-02	< 0.49	0.5	µg/L
PCBs	248353	AROCLOR 1260	2013-04-02	< 0.49	0.5	µg/L
Metals	248353	ARSENIC	2013-04-02	< 0.001	0.01	mg/L
Other Inorganics	248353	ASBESTOS	2013-04-02	< 0.19	7	MFL

Contaminant Class	DNREC ID	Contaminant	Sample Date	Result	Standard	Units
Pesticides	248353	ATRAZINE	2013-04-02	< 0.19	3	µg/L
Metals	248353	BARIUM	2013-04-02	< 0.5	1	mg/L
Petroleum Hydrocarbons	248353	BENZENE	2013-04-02	< 0.5	5	µg/L
Pesticides	248353	BENZO (A) PYRENE	2013-04-02	< 0.095	0.2	µg/L
Metals	248353	BERYLLIUM, TOTAL	2013-04-02	0.0006	0.004	mg/L
Pesticides	248353	BHC-GAMMA	2013-04-02	< 0.095	0.2	µg/L
Other Organics	248353	BROMOBENZENE	2013-04-02	< 0.5	Unregulated	µg/L
Other Organics	248353	BROMOCHLOROMETHANE	2013-04-02	< 1.5	Unregulated	µg/L
Other Organics	248353	BROMODICHLOROMETHANE	2013-04-02	< 0.5	TTHM 80	µg/L
Other Organics	248353	BROMOFORM	2013-04-02	< 0.5	TTHM 80	µg/L
Other Organics	248353	BROMOMETHANE	2013-04-02	< 0.5	Unregulated	µg/L
Metals	248353	CADMIUM	2013-04-02	0.0185	0.005	mg/L
Metals	248353	CALCIUM	2013-04-02	4.3	Unregulated	mg/L
Pesticides	248353	CARBOFURAN	2013-04-02	< 1	40	µg/L
Other Organics	248353	CARBON TETRACHLORIDE	2013-04-02	< 0.5	5	µg/L
Other Organics	248353	CARBONTOTAL	2013-04-02	< 0.5	Unregulated	µg/L
Other Organics	248353	CHLORDANE	2013-04-02	< 0.49	2	µg/L
Other Inorganics	248353	*CHLORIDE	2013-04-02	13	250	mg/L
Other Organics	248353	CHLOROETHANE	2013-04-02	< 4	Unregulated	µg/L
Other Organics	248353	CHLOROFORM	2013-04-02	< 0.5	TTHM 80	µg/L
Other Organics	248353	CHLOROMETHANE	2013-04-02	< 0.5	Unregulated	µg/L
Metals	248353	CHROMIUM	2013-04-02	< 0.002	0.1	mg/L
Other Organics	248353	CIS-1,2-DICHLOROETHYLENE	2013-04-02	< 0.5	70	µg/L
Other Organics	248353	CIS-1,3-DICHLOROPROPENE	2013-04-02	< 0.5	Unregulated	µg/L
Color	248353	*COLOR	2013-04-02	< 5	15	Units

Contaminant Class	DNREC ID	Contaminant	Sample Date	Result	Standard	Units
Other Inorganics	248353	CONDUCTIVITY 25 C UMHS/CM	2013-04-02	127	Unregulated	UMH O/CM
Metals	248353	COPPER FREE	2013-04-02	< 0.05	1	mg/L
Other Inorganics	248353	CYANIDE	2013-04-02	< 0.04	0.2	mg/L
Pesticides	248353	DALAPON	2013-04-02	< 4	200	µg/L
Other Organics	248353	DI(2-ETHYLHEXYL) ADIPATE	2013-04-02	< 0.47	400	µg/L
Other Organics	248353	DI(2-ETHYLHEXYL) PHTHALATE	2013-04-02	< 0.095	6	µg/L
Other Organics	248353	DIBROMOCHLOROMETHANE	2013-04-02	< 0.5	TTHM 80	µg/L
Other Organics	248353	DIBROMOMETHANE	2013-04-02	< 0.5	Unregulated	µg/L
Pesticides	248353	DICAMBA	2013-04-02	< 1	Unregulated	mg/L
Other Organics	248353	DICHLORODIFLUOROMETHANE	2013-04-02	< 0.5	Unregulated	µg/L
Other Organics	248353	DICHLOROMETHANE	2013-04-02	< 0.5	5	µg/L
Pesticides	248353	DINOSEB	2013-04-02	< 1	7	µg/L
Pesticides	248353	DIQUAT	2013-04-02	< 2	20	µg/L
Pesticides	248353	ENDOTHALL	2013-04-02	< 20	100	µg/L
Petroleum Hydrocarbons	248353	ETHYLBENZENE	2013-04-02	< 0.5	700	µg/L
Other Organics	248353	ETHYLENE DIBROMIDE	2013-04-02	< 0.02	0.05	µg/L
Other Inorganics	248353	***FLUORIDE	2013-04-02	< 0.1	2	mg/L
Pesticides	248353	GLYPHOSATE	2013-04-02	< 0.19	700	µg/L
Other Inorganics	248353	*HARDNESS, TOTAL (AS CaCO3)	2013-04-02	30	200	mg/L
Other Organics	248353	HEPTACHLOR	2013-04-02	< 0.095	0.4	µg/L
Other Organics	248353	HEPTACHLOR EPOXIDE	2013-04-02	< 0.095	0.2	µg/L
Pesticides	248353	HEXACHLOROBENZENE	2013-04-02	< 0.095	1	µg/L
Other Organics	248353	HEXACHLOROBUTADIENE	2013-04-02	< 0.5	Unregulated	µg/L
Pesticides	248353	HEXACHLOROCYCLOPENTADIENE	2013-04-02	< 0.19	50	µg/L
Metals	248353	*IRON	2013-04-02	< 0.1	0.3	mg/L

Contaminant Class	DNREC ID	Contaminant	Sample Date	Result	Standard	Units
Other Organics	248353	ALACHLOR (LASSO)	2013-04-02	< 0.19	2	µg/L
Metals	248353	LEAD	2013-04-02	0.0098	0.015	mg/L
Metals	248353	MAGNESIUM	2013-04-02	2.5	Unregulated	mg/L
Metals	248353	*MANGANESE	2013-04-02	0.10	0.05	mg/L
Other Organics	248353	M-DICHLOROBENZENE	2013-04-02	< 0.5	Unregulated	µg/L
Metals	248353	MERCURY	2013-04-02	< 0.002	0.002	mg/L
Other Organics	248353	METHOXYCHLOR	2013-04-02	< 0.19	40	µg/L
Petroleum Hydrocarbons	248353	***METHYL TERT-BUTYL ETHER (MTBE)	2013-04-02	< 0.5	10	µg/L
Other Organics	248353	NAPHTHALENE	2013-04-02	< 0.5	Unregulated	µg/L
Other Organics	248353	N-BUTYLBENZENE	2013-04-02	< 0.5	Unregulated	µg/L
Metals	248353	***NICKEL	2013-04-02	0.067	0.1	mg/L
Nutrients	248353	NITRATE	2013-04-02	5.9	10	mg/L
Nutrients	248353	NITRITE	2013-04-02	< 0.01	1	mg/L
Other Organics	248353	N-PROPYLBENZENE	2013-04-02	< 0.5	Unregulated	µg/L
Other Organics	248353	O-CHLOROTOLUENE	2013-04-02	< 0.5	Unregulated	µg/L
Other Organics	248353	O-DICHLOROBENZENE	2013-04-02	< 0.5	600	µg/L
Pesticides	248353	OXAMYL	2013-04-02	< 25	200	µg/L
Petroleum Hydrocarbons	248353	O-XYLENE	2013-04-02	< 0.5	See Total	µg/L
Other Organics	248353	P-CHLOROTOLUENE	2013-04-02	< 0.5	Unregulated	µg/L
Other Organics	248353	P-DICHLOROBENZENE	2013-04-02	< 0.5	75	µg/L
Other Organics	248353	PENTACHLOROPHENOL	2013-04-02	< 0.19	1	µg/L
Other Inorganics	248353	*pH	2013-04-02	5.6	6.5-8.6	Units
Pesticides	248353	PICLORAM	2013-04-02	< 2	500	µg/L
Other Organics	248353	P-ISOPROPYLTOLUENE	2013-04-02	< 0.5	Unregulated	µg/L
Nutrients	248353	POTASSIUM	2013-04-02	4.7	Unregulated	mg/L

Contaminant Class	DNREC ID	Contaminant	Sample Date	Result	Standard	Units
Other Organics	248353	SEC-BUTYLBENZENE	2013-04-02	< 0.5	Unregulated	µg/L
Metals	248353	SELENIUM	2013-04-02	< 0.01	0.05	mg/L
Other Inorganics	248353	SILICA	2013-04-02	7.9	Unregulated	mg/L
Pesticides	248353	SIMAZINE	2013-04-02	< 0.19	4	µg/L
Metals	248353	**SODIUM	2013-04-02	8.4	20	mg/L
Other Organics	248353	STYRENE	2013-04-02	< 0.5	100	µg/L
Other Inorganics	248353	*SULFATE	2013-04-02	5	250	mg/L
Other Inorganics	248353	*TDS	2013-04-02	96	500	mg/L
	248353	TEMPERATURE CENTIGRADE	2013-04-02	15.5	Unregulated	C
Other Organics	248353	TERT-BUTYLBENZENE	2013-04-02	< 0.5	Unregulated	µg/L
Other Organics	248353	***TETRACHLOROETHYLENE (PCE)	2013-04-02	< 0.5	1	µg/L
Metals	248353	THALLIUM, TOTAL	2013-04-02	< 0.001	0.002	mg/L
Petroleum Hydrocarbons	248353	TOLUENE	2013-04-02	< 0.5	1000	µg/L
Pesticides	248353	TOXAPHENE	2013-04-02	< 0.49	3	µg/L
Other Organics	248353	TRANS-1,2-DICHLOROETHYLENE	2013-04-02	< 0.5	100	µg/L
Other Organics	248353	TRANS-1,3-DICHLOROPROPENE	2013-04-02	< 0.5	Unregulated	µg/L
Other Organics	248353	***TRICHLOROETHYLENE (TCE)	2013-04-02	< 0.5	1	µg/L
Other Organics	248353	TRICHLOROFLUOROMETHANE	2013-04-02	< 0.5	Unregulated	µg/L
Other Organics	248353	TURBIDITY	2013-04-02	1.3	Unregulated	NTU
Metals	248353	URANIUM-234	2013-04-02	< 0.0005	0.03	mg/L
Other Organics	248353	***VINYL CHLORIDE	2013-04-02	< 0.5	1	µg/L
Petroleum Hydrocarbons	248353	XYLENE, META AND PARA	2013-04-02	< 1	See Total	µg/L
Petroleum Hydrocarbons	248353	XYLENES, TOTAL	2013-04-02	< 1.5	10000	µg/L
Metals	248353	*ZINC	2013-04-02	0.09	5	mg/L
Metals	248353	ANTIMONY TOTAL	2013-06-24	< 0.0005	0.006	mg/L

Contaminant Class	DNREC ID	Contaminant	Sample Date	Result	Standard	Units
Metals	248353	ARSENIC	2013-06-24	< 0.0005	0.01	mg/L
Metals	248353	BARIUM	2013-06-24	0.2236	1	mg/L
Metals	248353	BERYLLIUM, TOTAL	2013-06-24	0.0006	0.004	mg/L
Metals	248353	CADMIUM	2013-06-24	< 0.0005	0.005	mg/L
Metals	248353	CHROMIUM	2013-06-24	0.0007	0.1	mg/L
Metals	248353	LEAD	2013-06-24	0.0023	0.015	mg/L
Metals	248353	*MANGANESE	2013-06-24	0.0900	0.05	mg/L
Metals	248353	MERCURY	2013-06-24	< 0.0005	0.002	mg/L
Metals	248353	***NICKEL	2013-06-24	0.0058	0.1	mg/L
Metals	248353	SELENIUM	2013-06-24	< 0.01	0.05	mg/L
Metals	248353	THALLIUM, TOTAL	2013-06-24	< 0.0005	0.002	mg/L
Metals	248353	URANIUM-238	2013-06-24	< 0.0005	0.03	mg/L
Metals	248353	*IRON	2014-12-23	< 0.025	0.3	mg/L
Pathogens	248353	TOTAL COLIFORM	2015-04-16	A	A	CFU
Other Inorganics	248353	ALKALINITY TOTAL	2015-06-23	34.2	Unregulated	mg/L
Metals	248353	ANTIMONY TOTAL	2015-06-23	< 0.0005	0.006	mg/L
Metals	248353	ARSENIC	2015-06-23	< 0.0005	0.01	mg/L
Metals	248353	BARIUM	2015-06-23	0.0983	1	mg/L
Metals	248353	BERYLLIUM, TOTAL	2015-06-23	< 0.0005	0.004	mg/L
Metals	248353	CADMIUM	2015-06-23	< 0.0005	0.005	mg/L
Other Inorganics	248353	*CHLORIDE	2015-06-23	10.4	250	mg/L
Metals	248353	CHROMIUM	2015-06-23	0.0010	0.1	mg/L
Metals	248353	COPPER FREE	2015-06-23	0.0027	1	mg/L
Other Inorganics	248353	***FLUORIDE	2015-06-23	< 0.1	2	mg/L
Radionuclides	248353	GROSS ALPHA PARTICLE ACTIVITY	2015-06-23	1.08+/- 0.833	15	pCi/L

Contaminant Class	DNREC ID	Contaminant	Sample Date	Result	Standard	Units
Other Inorganics	248353	*HARDNESS, TOTAL (AS CaCO3)	2015-06-23	45.4	200	mg/L
Metals	248353	*IRON	2015-06-23	< 0.1	0.3	mg/L
Metals	248353	LEAD	2015-06-23	< 0.0005	0.015	mg/L
Metals	248353	*MANGANESE	2015-06-23	0.0172	0.05	mg/L
Metals	248353	MERCURY	2015-06-23	< 0.0005	0.002	mg/L
Metals	248353	***NICKEL	2015-06-23	0.0012	0.1	mg/L
Nutrients	248353	NITRATE	2015-06-23	3.9	10	mg/L
Nutrients	248353	NITRITE	2015-06-23	< 0.1	1	mg/L
Radionuclides	248353	RADIUM-226	2015-06-23	0.840 +/- 0.437	0	pCi/L
Radionuclides	248353	RADIUM-228	2015-06-23	0.980 +/- 0.423	0	pCi/L
Metals	248353	SELENIUM	2015-06-23	< 0.01	0.05	mg/L
Metals	248353	**SODIUM	2015-06-23	7.3	20	mg/L
Other Inorganics	248353	*SULFATE	2015-06-23	14.0	250	mg/L
Other Inorganics	248353	*TDS	2015-06-23	108	500	mg/L
Metals	248353	THALLIUM, TOTAL	2015-06-23	< 0.0005	0.002	mg/L
Pathogens	248353	TOTAL COLIFORM	2015-06-23	A	A	CFU
Other Organics	248353	TURBIDITY	2015-06-23	0.35	Unregulated	NTU
Metals	248353	URANIUM-238	2015-06-23	< 0.0005	0.03	mg/L
Metals	248353	CHROMIUM	2018-01-22	1.3	100	µg/L
Metals	248353	CHROMIUM DISSOLVED	2018-01-22	1.3	100	µg/L
Metals	248353	CHROMIUM VI	2018-01-22	2.7	100	µg/L
Other Organics	248353	N-ETHYL PERFLUOROOCTANE SULFONAMIDOACETIC ACID (NEFOSAA)	2018-01-22	1.68	Unregulated	ng/L
Other Organics	248353	N-METHYL PERFLUOROOCTANE SULFONAMIDOACETIC ACID (NMEFOSAA)	2018-01-22	2.75	Unregulated	ng/L
Other Organics	248353	PERFLUOROBUTANESULFONIC ACID (PFBS)	2018-01-22	8.24	Unregulated	ng/L

Contaminant Class	DNREC ID	Contaminant	Sample Date	Result	Standard	Units
Other Organics	248353	PERFLUORODECANOIC ACID (PFDA)	2018-01-22	0.61	Unregulated	ng/L
Other Organics	248353	PERFLUORODODECANOIC ACID (PFDOA)	2018-01-22	0.49	Unregulated	ng/L
Other Organics	248353	PERFLUOROHEPTANOIC ACID (PFHPA)	2018-01-22	5.82	Unregulated	ng/L
Other Organics	248353	PERFLUOROHEXANESULFONIC ACID (PFHXS)	2018-01-22	25.8	Unregulated	ng/L
Other Organics	248353	PERFLUOROHEXANOIC ACID (PFHXA)	2018-01-22	11.7	Unregulated	ng/L
Other Organics	248353	PERFLUORONONANOIC ACID (PFNA)	2018-01-22	32.2	Unregulated	ng/L
Other Organics	248353	PERFLUOROOCTANESULFONIC ACID (PFOS)	2018-01-22	172	Unregulated	ng/L
Other Organics	248353	PERFLUOROOCTANOIC ACID (PFOA)	2018-01-22	15.1	Unregulated	ng/L
Other Organics	248353	PERFLUOROTETRADECANOIC ACID (PFTEA)	2018-01-22	0.26	Unregulated	ng/L
Other Organics	248353	PERFLUOROTRIDECANOIC ACID (PFTRIA)	2018-01-22	1.15	Unregulated	ng/L
Other Organics	248353	PERFLUOROUNDECANOIC ACID (PFUNA)	2018-01-22	0.97	Unregulated	ng/L

Appendix D. Data Sources

Table 14. Data Sources Used in Source Water Assessments

The data used in the Source Water Assessments is provided by many State Agencies. For more information regarding each program, you may contact them directly.

Type	Organization	Section	Phone Number
Public Water Supply Well Data	Department of Natural Resources and Environmental Control	Water Supply Section	(302) 739-9945
Public Water Supply Well Data	Delaware Geological Survey		(302) 831-2833
Water Quality Data	Department of Health and Social Services	Division of Public Health Office of Drinking Water	(302) 741-8630
Land Use / Land Cover GIS Coverage	Delaware Office of State Planning Coordination		(302) 739-3090
Animal Feedlot Operations	County Conservation Districts	Kent	(302) 697-2600
Animal Feedlot Operations	County Conservation Districts	New Castle	(302) 832-3100
Animal Feedlot Operations	County Conservation Districts	Sussex	(302) 856-3990
Combined Sewer Overflows (CSOs)	Department of Natural Resources and Environmental Control	Surface Water Discharges Section	(302) 739-9946
Dredge Spoil Disposal Areas	Department of Natural Resources and Environmental Control	Soil and Water Conservation	(302) 739-9921
Hazardous Waste Generator Sites	Department of Natural Resources and Environmental Control	Solid and Hazardous Waste Management Branch	(302) 739-9403
Landfills and Dumps	Department of Natural Resources and Environmental Control	Solid and Hazardous Waste Management Branch	(302) 739-9403
Large On-site Septic Systems	Department of Natural Resources and Environmental Control	Ground Water Discharges Section	(302) 739-9948
NPDES Wastewater Outfalls	Department of Natural Resources and Environmental Control	Surface Water Discharges Section	(302) 739-9946
Pesticide Loading, Mixing, and Storage Facilities	Delaware Department of Agriculture	Pesticide Management Section	(302) 739-4811
Salvage Yards	Department of Natural Resources and Environmental Control	Solid and Hazardous Waste Management Branch	(302) 739-9403
Site Investigation and Restoration Branch (SIRB) [Superfund] Sites	Department of Natural Resources and Environmental Control	Site Investigation and Restoration Branch	(302) 395-2600
Sludge Application Sites	Department of Natural Resources and Environmental Control	Surface Water Discharges Section	(302) 739-9946
Spray Irrigation Sites	Department of Natural Resources and Environmental Control	Ground Water Discharges Section	(302) 739-9948
Tire Piles	Department of Natural Resources and Environmental Control	Solid and Hazardous Waste Management Branch	(302) 739-9403
Toxic Release Inventory Sites	Department of Natural Resources and Environmental Control	Air Quality Management Section	(302) 739-9402
Underground Storage Tanks	Department of Natural Resources and Environmental Control	Underground Storage Tank Branch	(302) 395-2500

Appendix E. Historical Wells

Table 15. Historical Record of All Wells Associated with Facility.

DNREC ID	Well Type	Local ID	Permit Issued	Year Constructed	Year Abandoned	Well Capacity (gpm)	Diameter (inches)	Screen Interval (fbgs)
242434	Test	-	-	2013	-	150	6	65-95
246039	Public	-	Voided	-	-	-	-	-
242494	MW	MW-1	-	2013	2015	-	2	70-100